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Enhanced effect of silver nanoparticles on the bioactivity of hydroxyapatite nanocomposite

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Abstract

Hydroxyapatite/polyvinyl alcohol (PVA) nanocomposite named (HAV) was prepared via an insitu biomimetic approach. It has been doped with different concentrations of silver nanoparticles. Characterizations of the as prepared powder samples by different techniques such as Inductively coupled plasma-optical emission spectroscopy (ICP-OES), X-ray diffraction (XRD), Transmission electron microscope (TEM) and Fourier transform Infrared (FT-IR) were used. Bioactivity evaluation has been carried out in simulated body fluid (SBF). The bactericidal effect against gram positive bacteria such as staphylococcus aureus and streptococcus pyogenes and gram negative bacteria such as pseudomonas aerginosa was carried out. The hydroxyapatite nanocomposite and the silver nanoparticles have an average diameter of about 40 nm and 30 nm, respectively. The results show that, the presence of silver nanoparticles facilitate the formation of rod like shape of hydroxyapatite. It can be noticed that, the least amount of silver nanoparticles less than 0.001 ppm that could not be detected by ICP enhance the bioactivity of the hydroxyapatite nanocomposite very clearly. Silver nanoparticle has a spontaneous and rapid effect on the bioactivity in SBF. Antibacterial study on the prepared samples revealed that, the effect of silver nanoparticles is dose dependent and is more pronounced against gram negative organisms than gram-positive bacteria. The suggested materials can be considered as a promising biomaterial in bone and reconstructive surgery applications.

Biography

Professor Amany Mostafa, has completed her Ph.D. from Cairo University and postdoctoral studies from Georgia Institute of Technology, (Petite Parker Institute for Bioengineering and Bioscience), USA and University of Rennes1, France. She was the head of Biomaterials Department at the National Research Centre. She has published more than 45 papers in reputed journals. The research activities of Prof. Mostafa are in the broad area of glasses, ceramics and polymer/glass composites for biomedical, functional and/or structural applications. Prof. Mostafa has also developed the method for production of nanostructured materials and composites with defined surface topography with potential use in the biomedical field.